
PWC SAN DIEGO

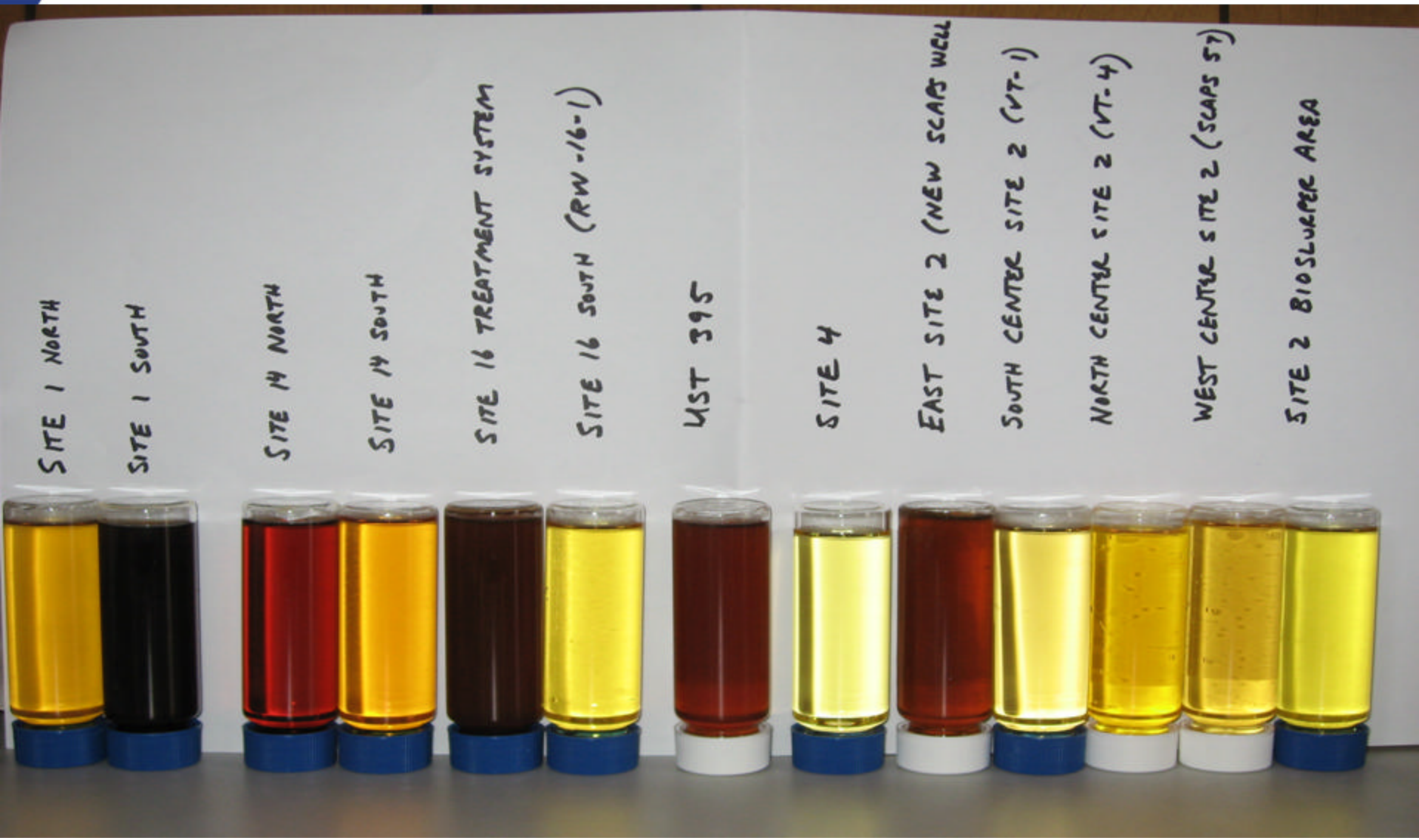
Purpose of SCAPS Investigation

- Free product acts as a continuous source of dissolved phase groundwater contamination and vapor intrusion
- Removal of free product is required by NDEP and is generally the first step in site closure
- Free product contamination at Sites 1, 2, 14, 16, UST 395, and UST 806 is not fully delineated (Site 6 was inaccessible to SCAPS rig because of soft soils)

GOALS OF INVESTIGATION:

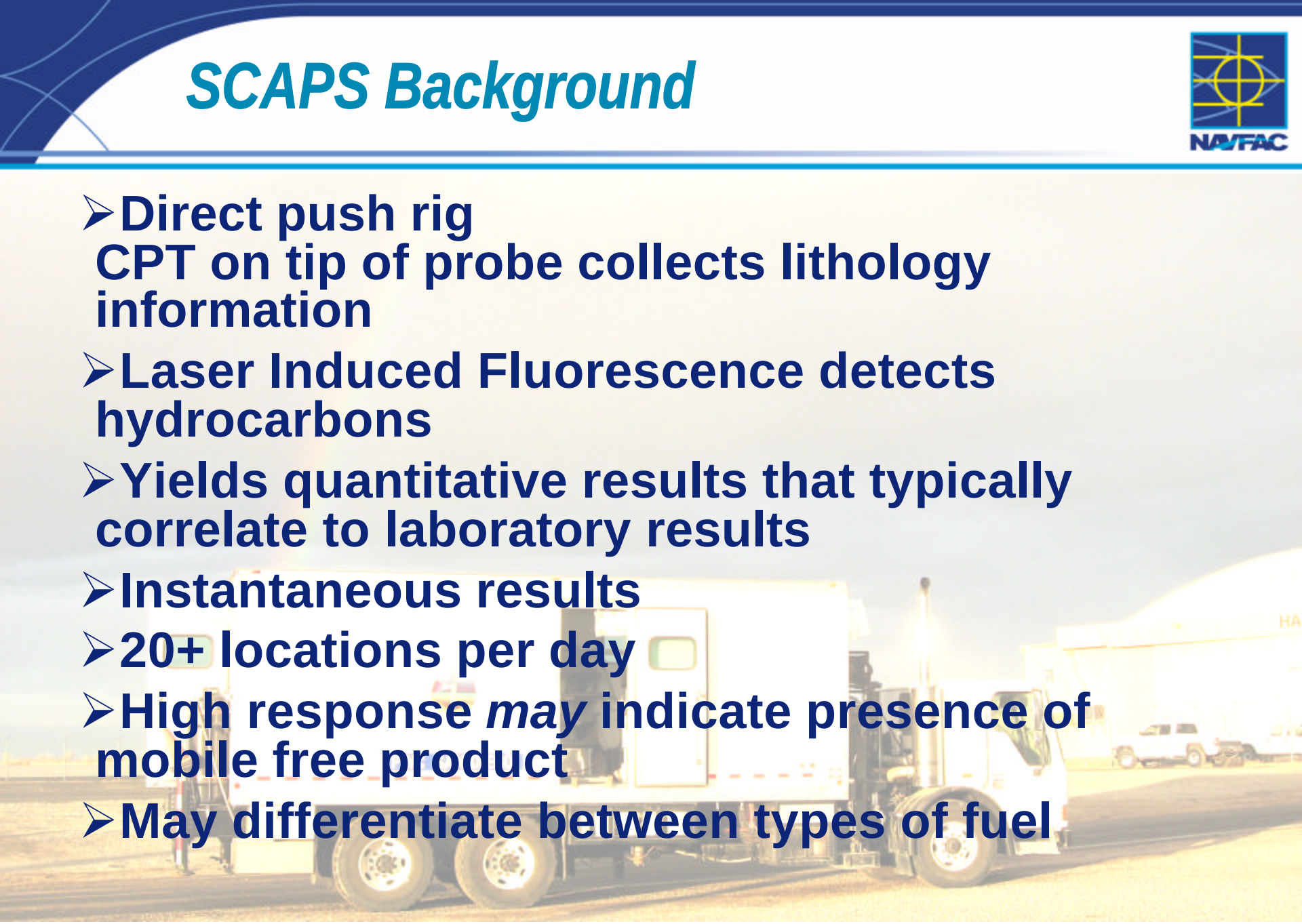
- Identify source or sources of free product
- Define lateral and vertical extent of free product at each site

The Rainbow of Free Product at NAS Fallon

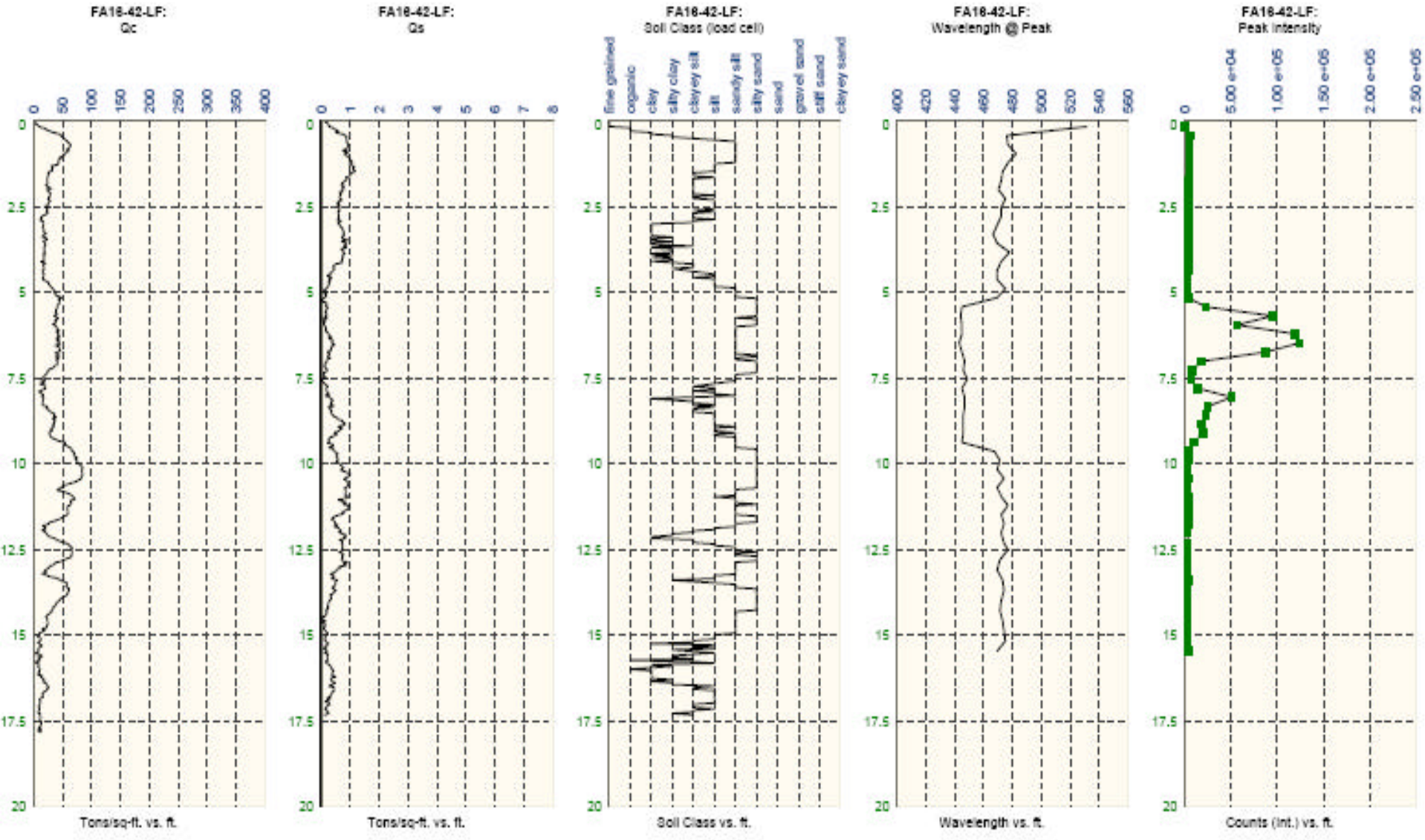


SCAPS Background

- Direct push rig
  CPT on tip of probe collects lithology information
- Laser Induced Fluorescence detects hydrocarbons
- Yields quantitative results that typically correlate to laboratory results
- Instantaneous results
- 20+ locations per day
- High response *may* indicate presence of mobile free product
- May differentiate between types of fuel



Typical SCAPS Results



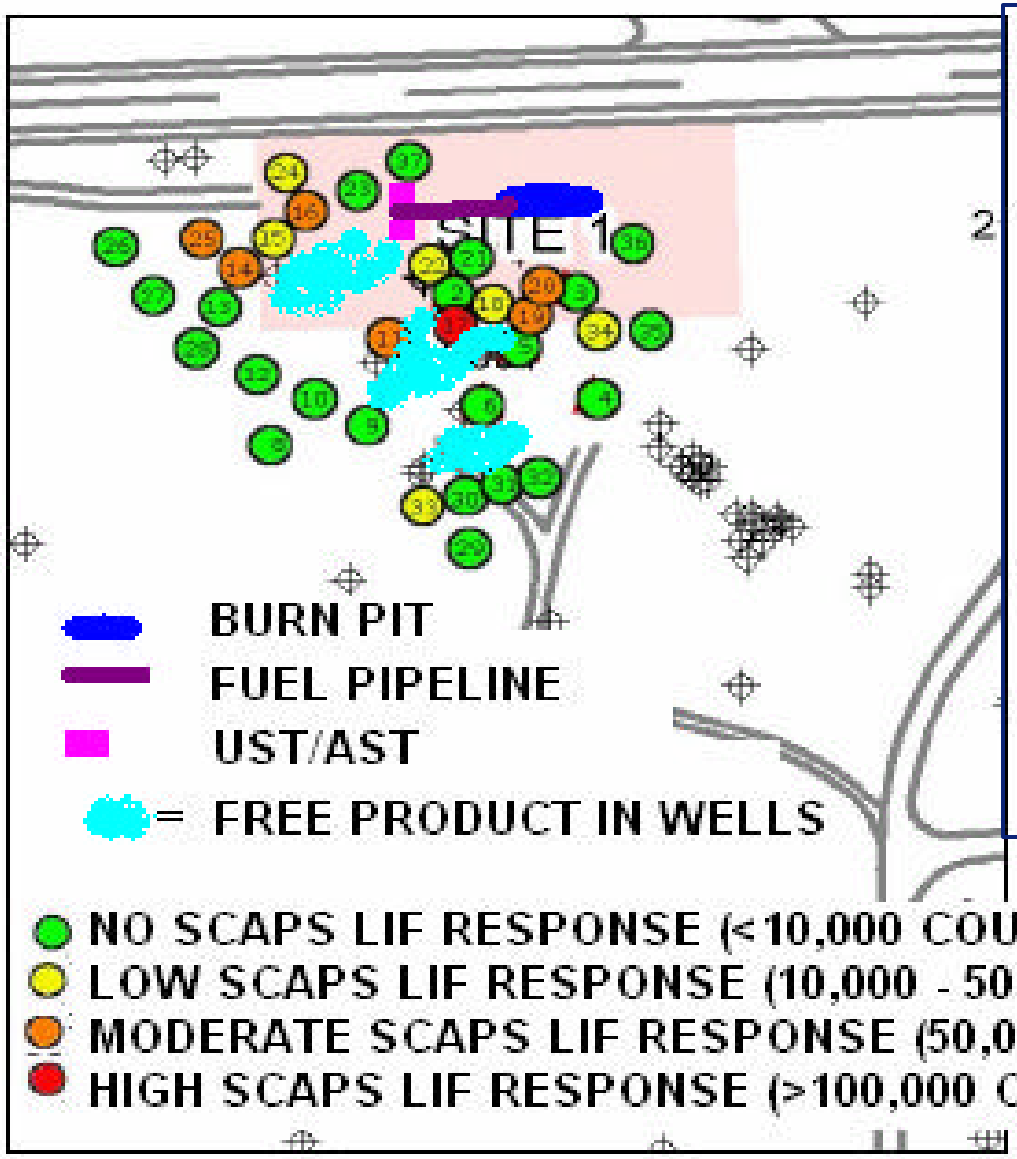
SCAPS Limitations

- Does not detect dissolved phase hydrocarbons
- Lower detection limit is at least 350 ppm
- Presence or absence of mobile free product is dependent on concentration AND soil type – results must be interpreted
- The *ONLY* way to really know that mobile free product is present is to install a well (38 temporary wells were installed during the SCAPS investigation)

Additional Work Conducted During the SCAPS Investigation

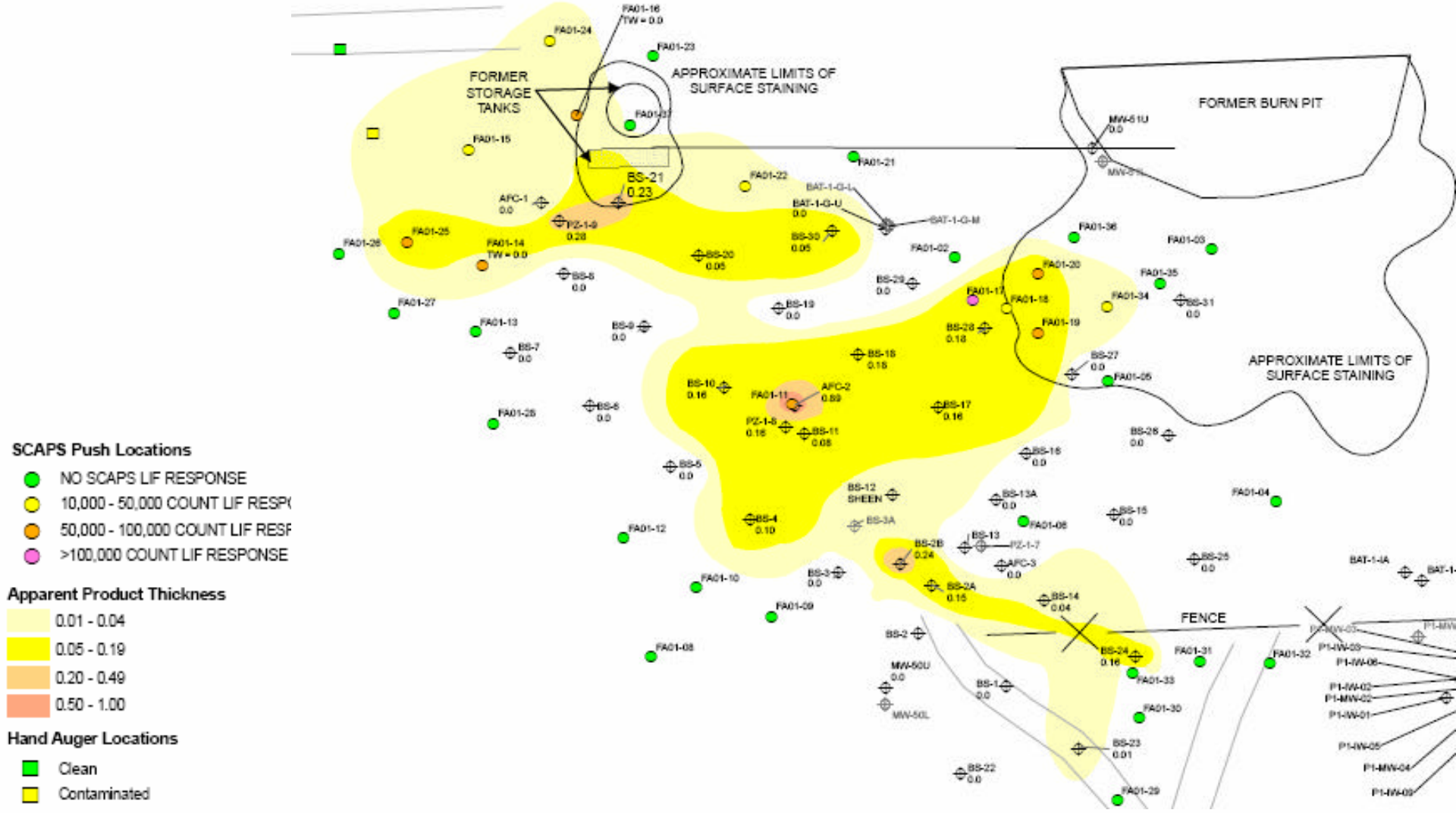
- Collected free product measurements from every well at Sites 1, 2, 14, 16, UST 395, and UST 806
- Collected free product measurements using clear free product bailers in addition to oil/water interface probes (bailers can more easily detect sheens and never yield false negative results)
- Conducted an inventory of wells that are screened across the water table to identify gaps in well coverage
- Studied facility drawings to identify potential new sources
- Analyzed free product samples for identification and physical properties
- Analyzed soil/free product samples for free product mobility and potential free product recoverability

Site 1 – Crash Crew Fire Rescue Training Pit

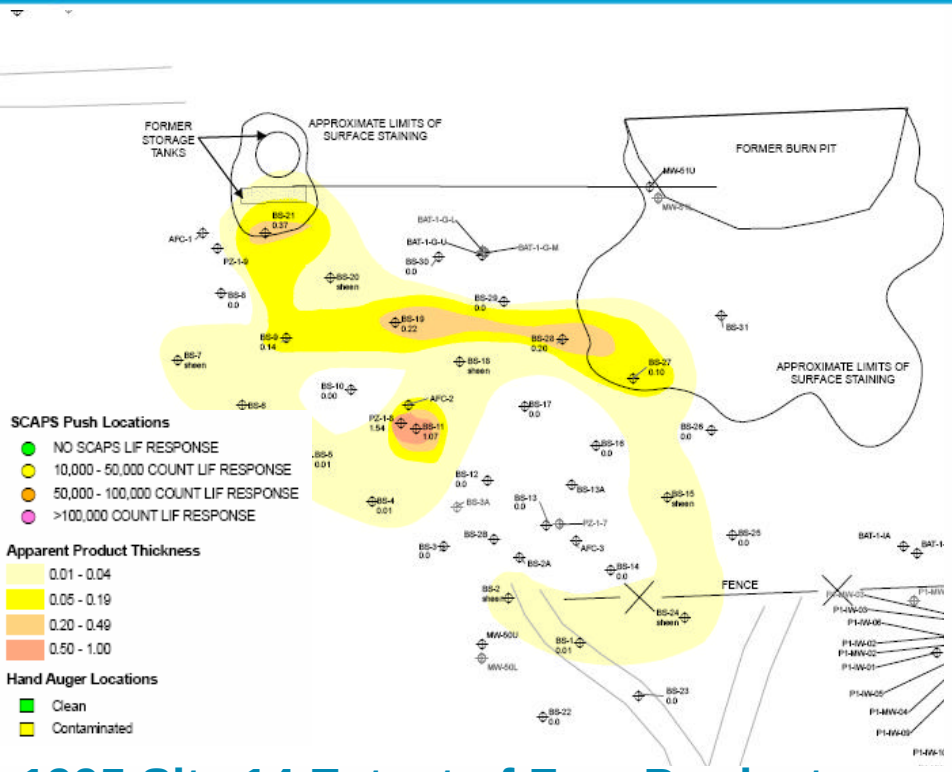


- MAXIMUM FREE PRODUCT THICKNESS 0.8 FEET, TYPICAL IS 0.2 FEET
- APPROXIMATELY 0.4 ACRES OF FREE PRODUCT
- APPROXIMATELY 0.9 ACRES OF PETROLEUM-CONTAMINATED SOIL
- DEPTH OF CONTAMINATION IS 5.5-7 FEET BGS (ONLY AT GROUNDWATER / VADOSE ZONE INTERFACE)
- PREDOMINANTLY JET

Site 1 – Crash Crew Fire Rescue Training Pit



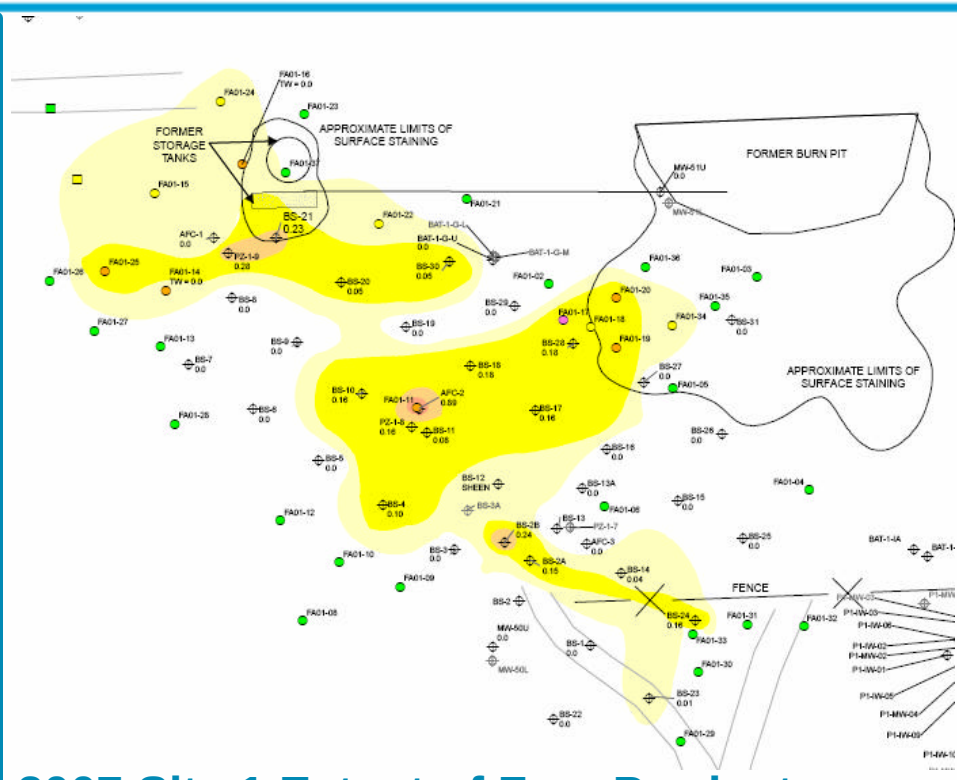
Site 1 Free Product Plume Change 1995 to 2007



1995 Site 14 Extent of Free Product

0.8 acres of petroleum- contaminated soil

0.3 acres of free product > 0.5 inches



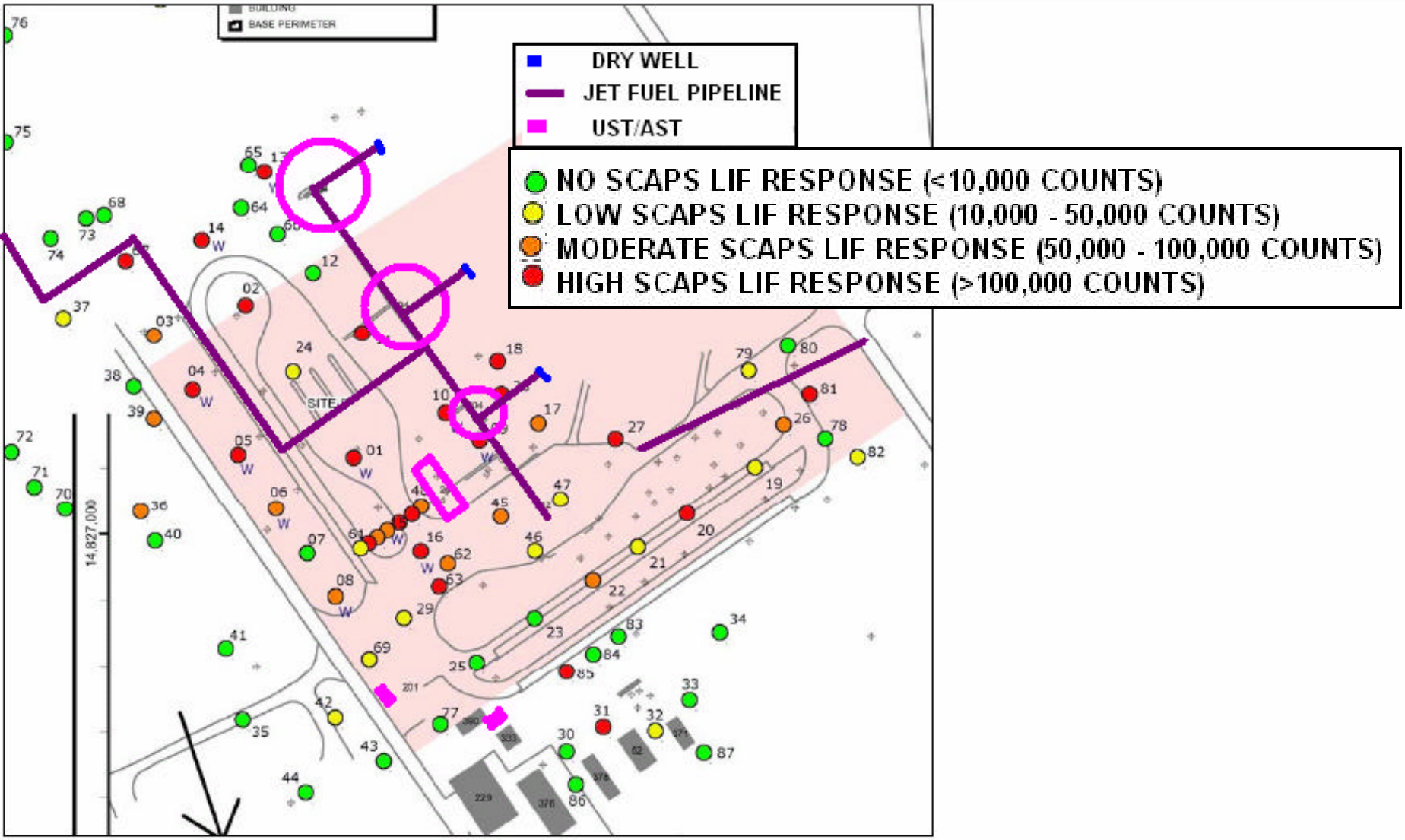
2007 Site 1 Extent of Free Product

0.9 acres of petroleum- contaminated soil

0.4 acres of free product > 0.5 inches

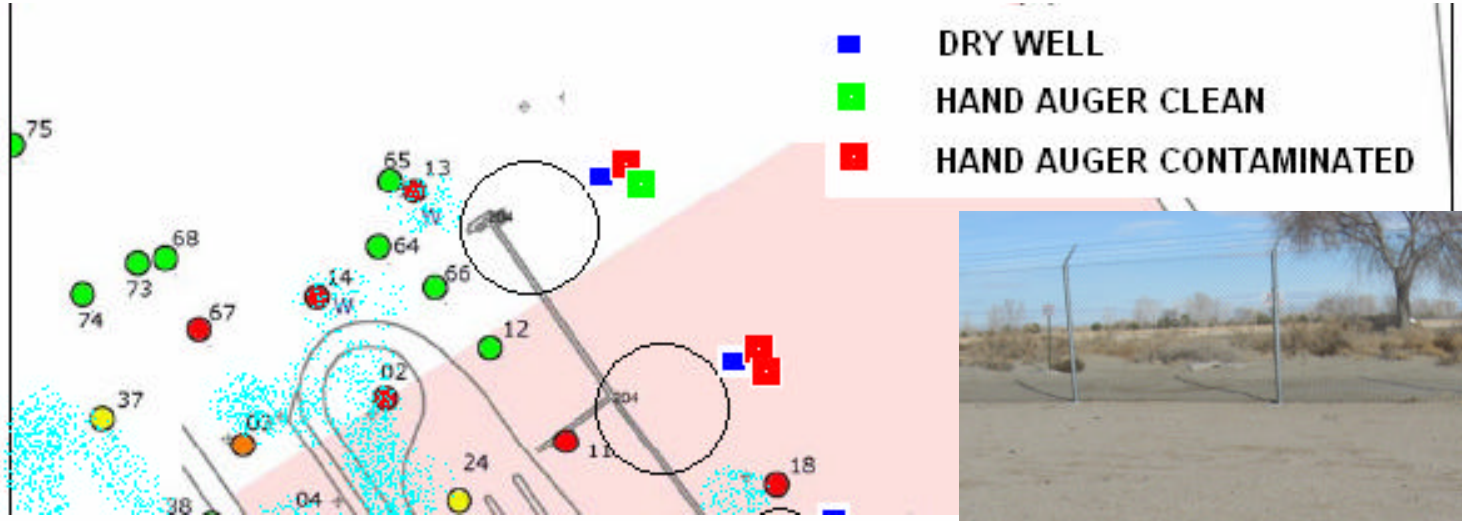
***Extent of free product did not increase—only the extent of the investigation

Site 2 – New Fuel Farm

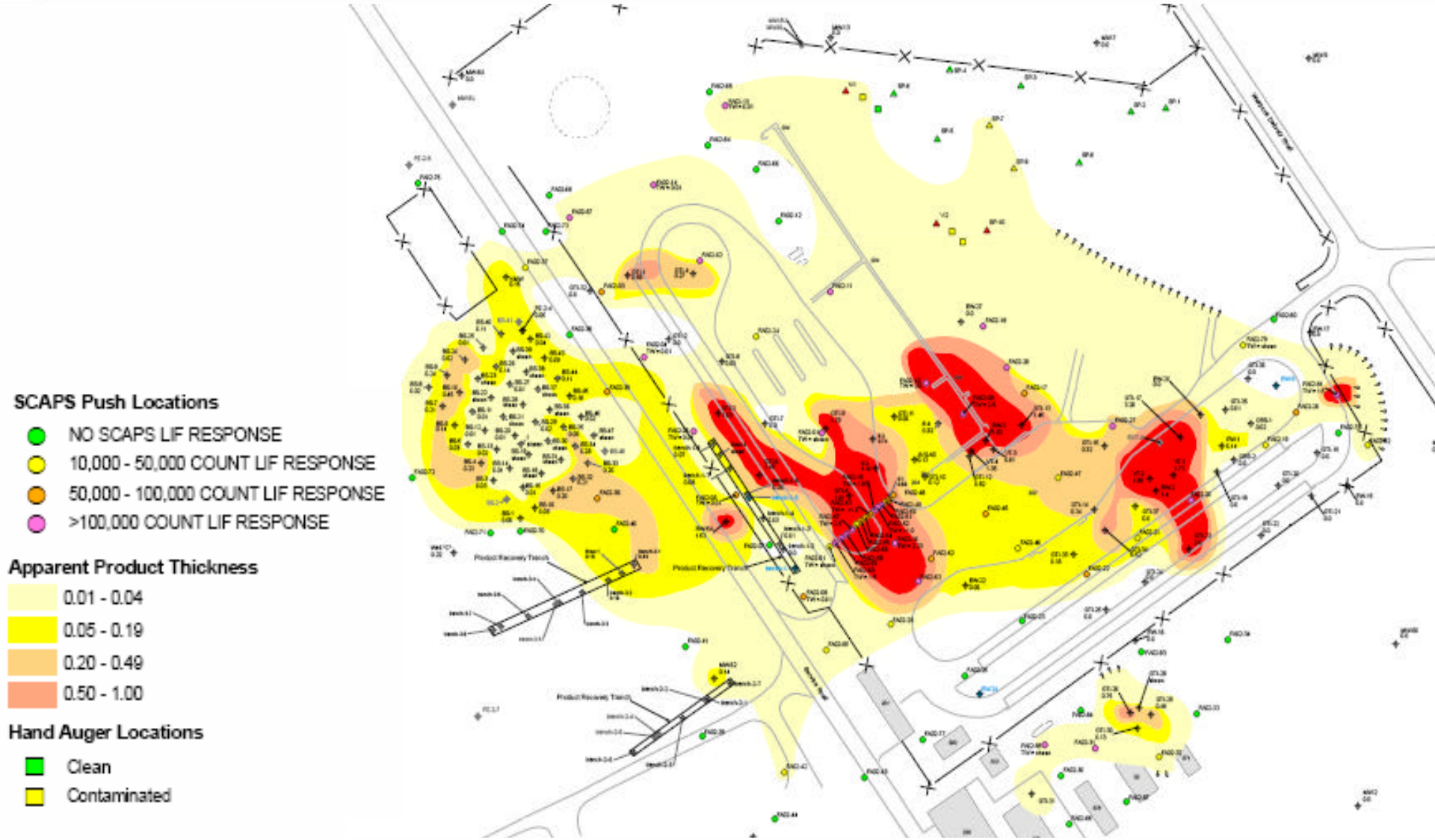


HAVOIS Results
(Hand Auger Visual and Olfactory Inspection System)

Used to investigate areas inaccessible by the SCAPS rig



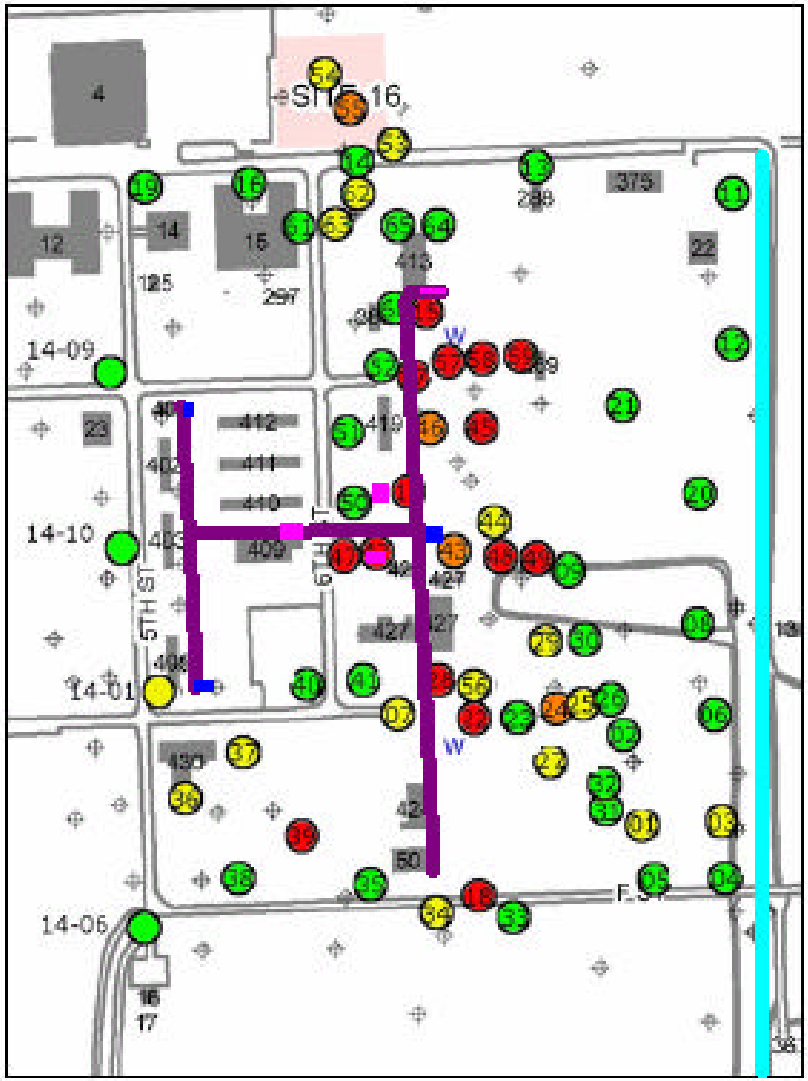
Site 2 – Extent of Free Product



Site 2 Observations

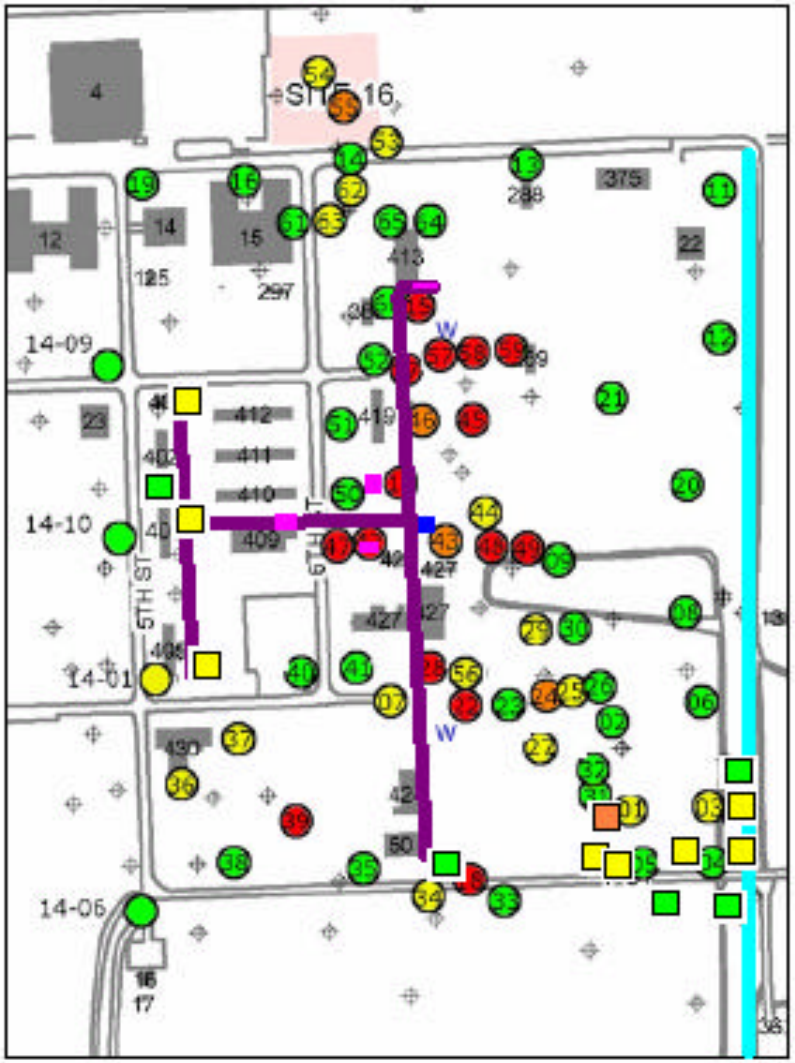
- FREE PRODUCT THICKNESS VARIES GREATLY ACROSS SITE, UP TO 3 FEET
- DEPTH OF FREE PRODUCT IS 8 – 10 FEET BGS—AT GROUNDWATER/VADOSE ZONE INTERFACE (slightly deeper than other sites)
- SMEAR ZONE IS <2 FEET, INDICATING THAT LARGE FLUCTUATIONS IN WATER TABLE LEVES HAVE NOT OCCURRED
- AREA OF FREE PRODUCT >0.5 INCH = ~ 6 ACRES
- AREA OF FUEL-CONTAMINATED SMEAR ZONE SOILS = 14 ACRES
- HIGHLY VARIABLE GEOLOGY AT SITE—even more than other Fallon sites
- POTENTIAL NEW SOURCE ON EASTERN SIDE OF SITE 2
- MULTIPLE JET FUEL SOURCES LIKELY (AVGAS IS PRESENT IN CENTER OF SITE 4)

Site 16 – Old Fuel Farm



- The Old Fuel Farm is only a minor source of contamination
- The fuel oil pipeline (and associated drywells and tanks) appears to be the major source of Site contamination
- Potential area of petroleum-contaminated smear zone soil is ~16 acres
- Only one well (RW-16-1) exceeds 0.5-inch free product standard
- Free product and contaminated soil is at the groundwater / vadose zone interface (5 – 7 feet bgs)

Site 16 Hand Auger Results



- DRY WELL
- FUEL OIL PIPELINE
- UST/AST
- E4X DRAIN

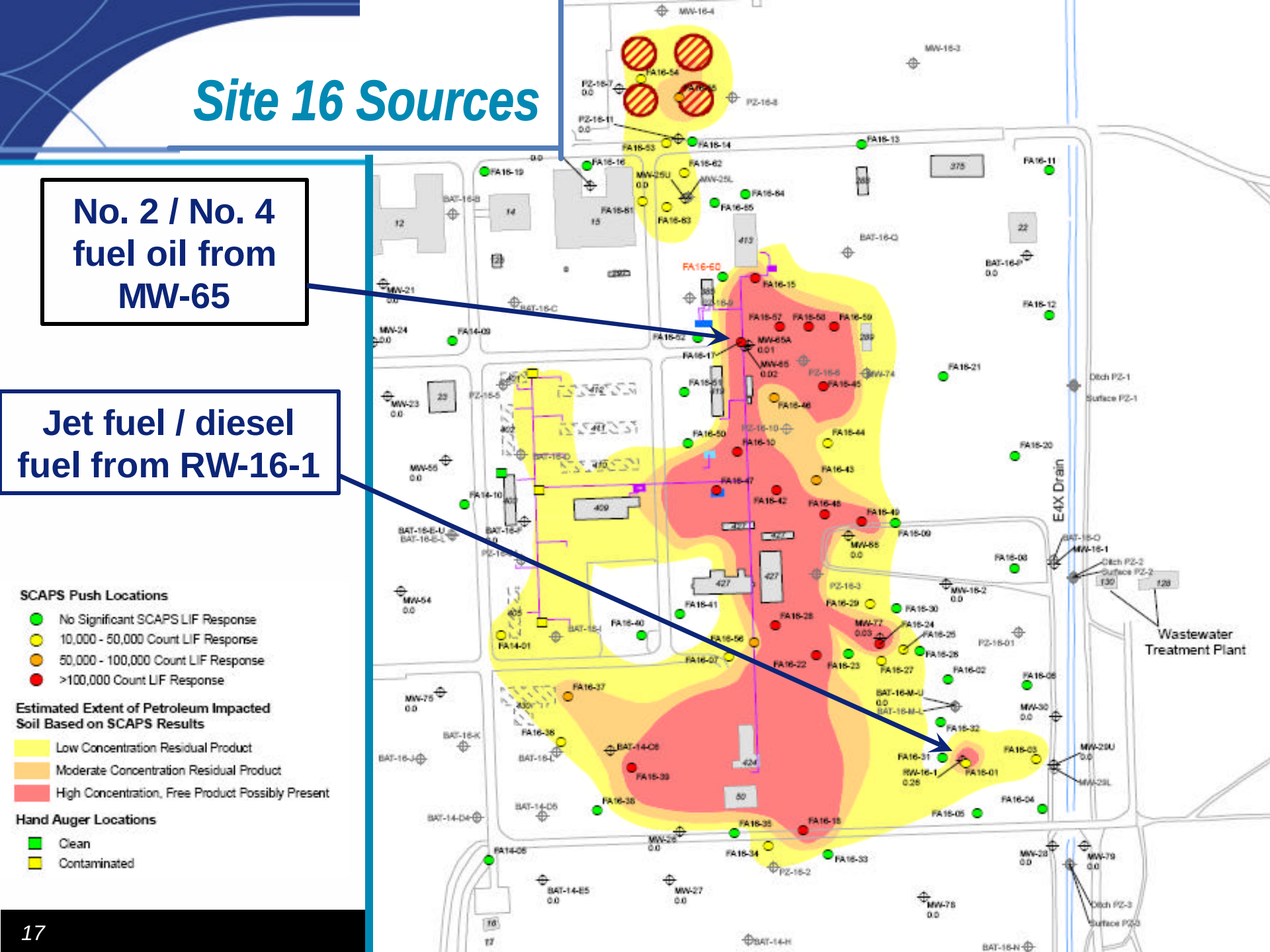
- HAND AUGER CLEAN
- HAND AUGER STAINING
- HAND AUGER VISIBLE PRODUCT

- NO SCAPS LIF RESPONSE (<10,000 COUNTS)
- LOW SCAPS LIF RESPONSE (10,000 - 50,000 COUNTS)
- MODERATE SCAPS LIF RESPONSE (50,000 - 100,000 COUN
- HIGH SCAPS LIF RESPONSE (>100,000 COUNTS)

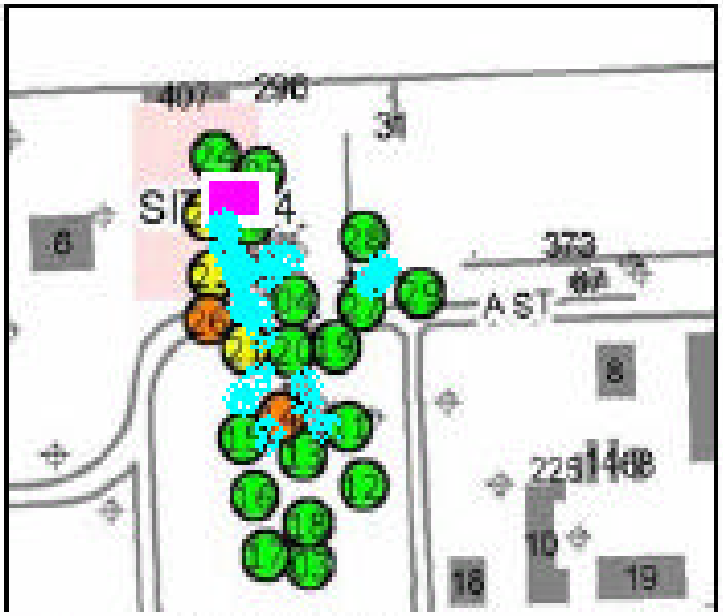
Site 16 Sources

No. 2 / No. 4 fuel oil from MW-65

Jet fuel / diesel fuel from RW-16-1

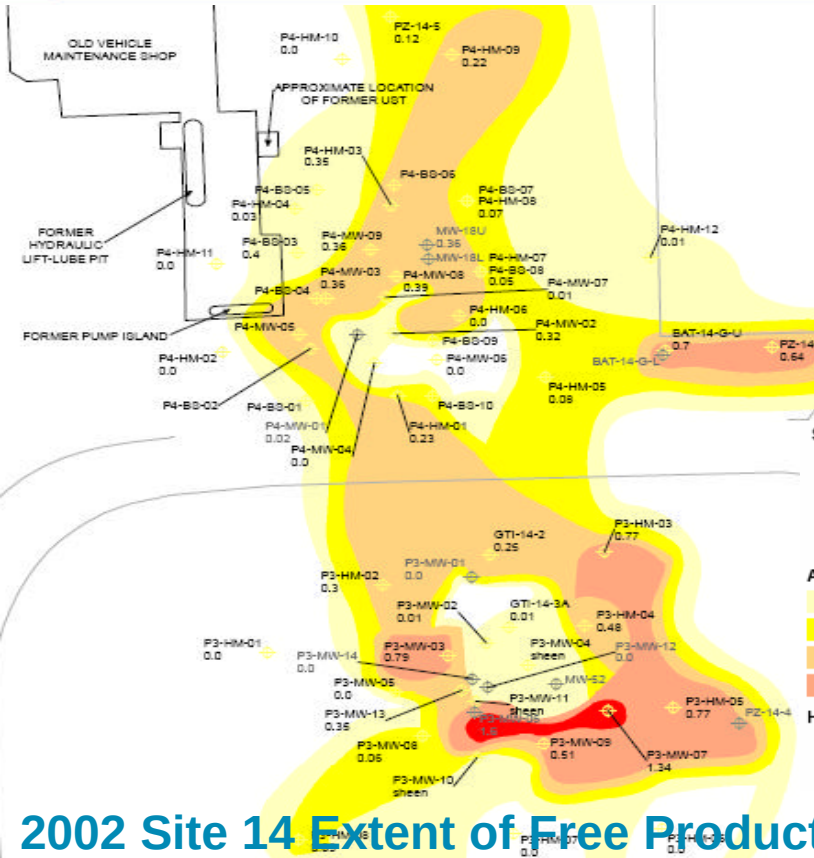


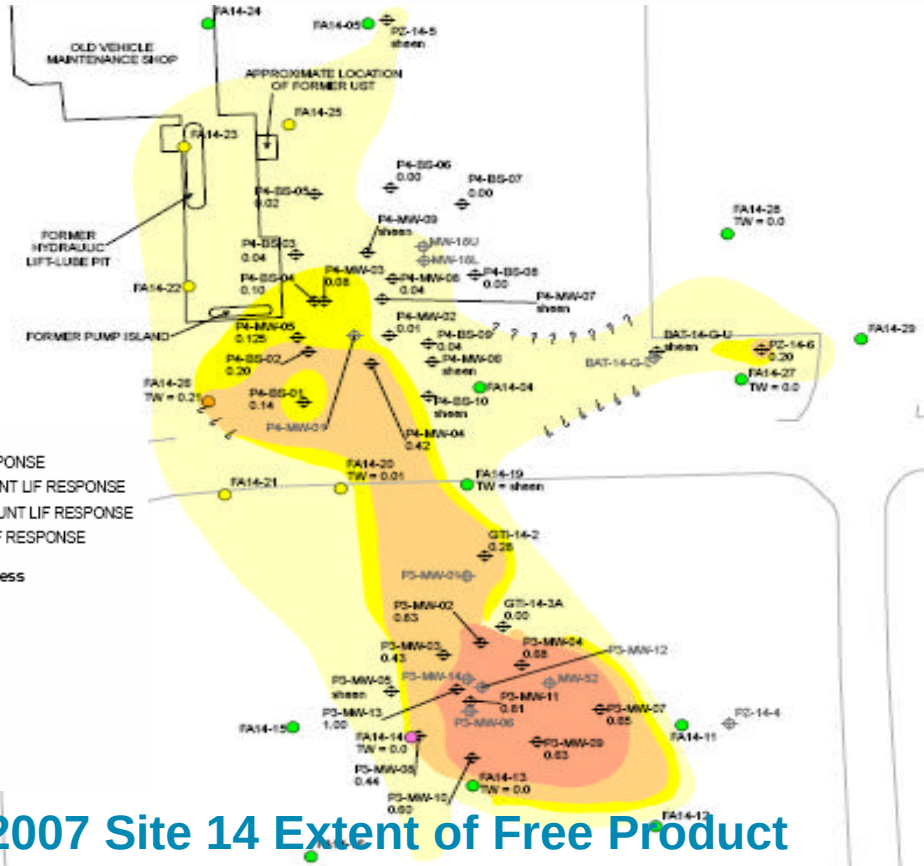
Site 14 – Old Vehicle Maintenance Shop



- **SCAPS observations:**
- Apparent free product thickness 0.1 to 1.0 feet
- Contamination only at smear zone (5.5 to 7.5 feet bgs)
- Gasoline (with small jet fuel / diesel component)

Site 14 – Old Vehicle Maintenance Shop
Free Product Plume Change 2002 to 2007





2002 Site 14 Extent of Free Product

1.6 acres of petroleum-contaminated smear zone soil

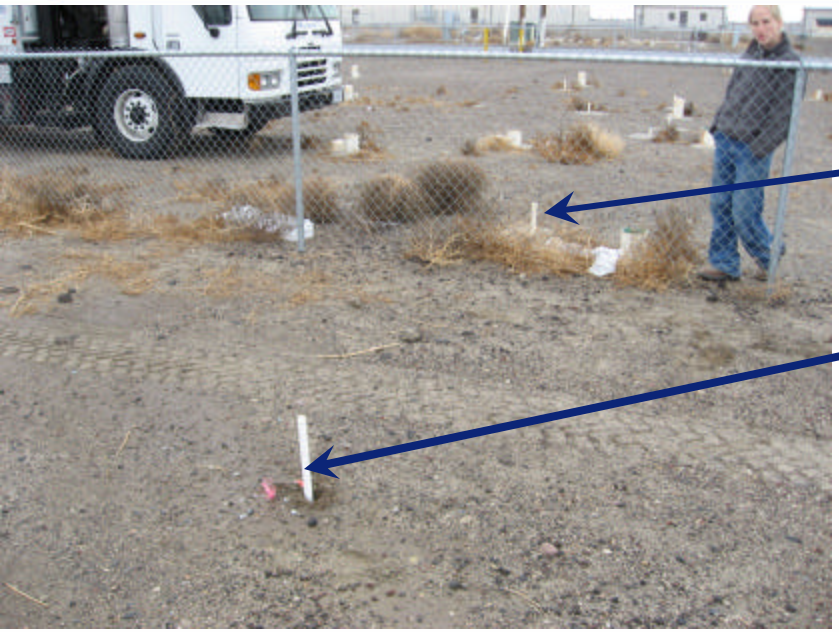
0.8 acres of free product > 0.5 inches

2007 Site 14 Extent of Free Product

1.0 acre of petroleum-contaminated soil smear zone soil

0.4 acres of free product > 0.5 inches

GEOLOGY DICTATES FREE PRODUCT OCCURRENCE AND MIGRATION



1 FOOT OF PRODUCT IN THIS WELL (P3-MW-10 at Site 14)

NO SCAPS LIF RESPONSE HERE

NO SHEEN IN WELL

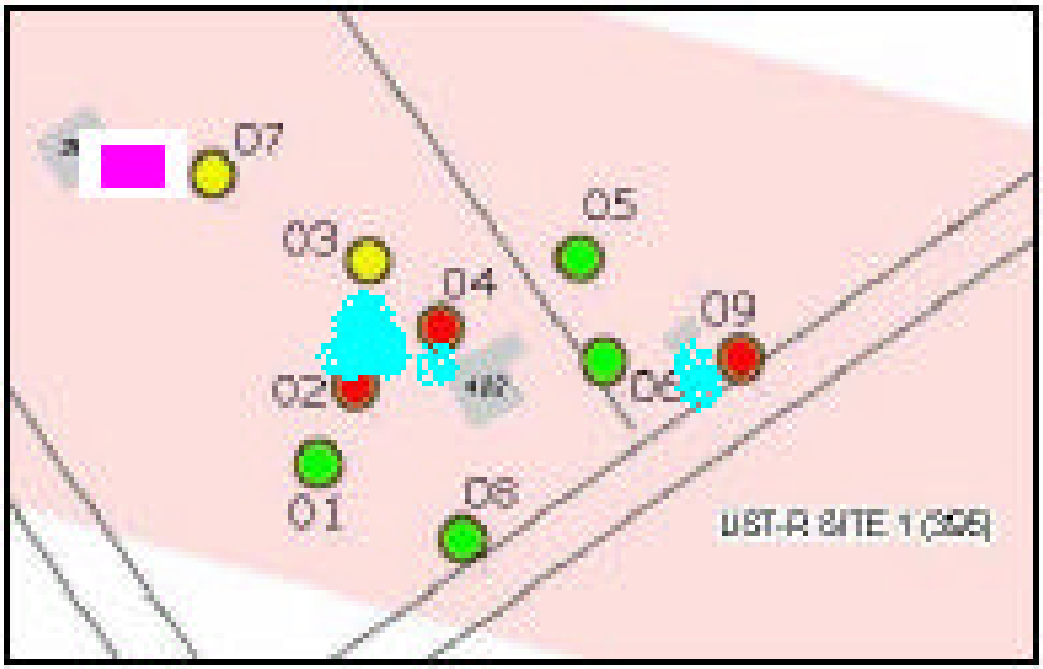
LABORATORY RESULTS WERE ND

0.4 FOOT OF PRODUCT IN THIS WELL (P3-MW-10 at Site 14)

NO FREE PRODUCT IN THIS WELL

MODERATE SCAPS RESPONSE

UST 395



UST/AST

= FREE PRODUCT IN WELLS

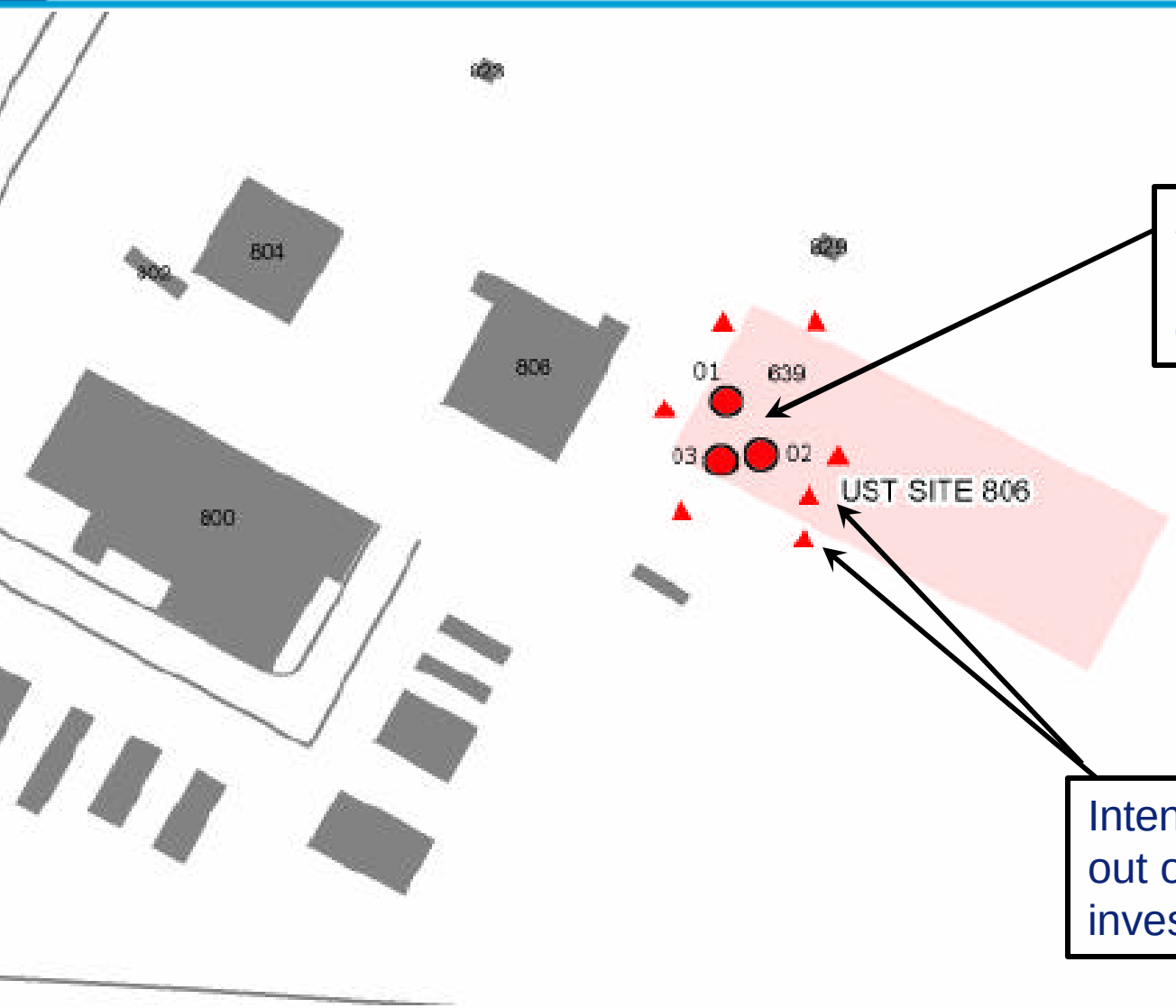
SCAPS observations:

- Only 9 pushes -- Investigation incomplete—nature and extent not defined
- Diesel fuel (with traces of gasoline)

UST 806

- **SCAPS observations**
- Only 3 pushes –Investigation incomplete—nature and extent not defined
- Fuel oil
- Two USTs removed in 1992
- Two ASTs removed in 2002
- Piping also a source of contamination

UST 806



3 SCAPS pushes (all indicated petroleum contamination)

Intended step-out locations (ran out of time); will be addressed in investigation work this summer

Comparison of Site 1 Core to SCAPS and Laboratory Results

Site 1, SCAPS 17

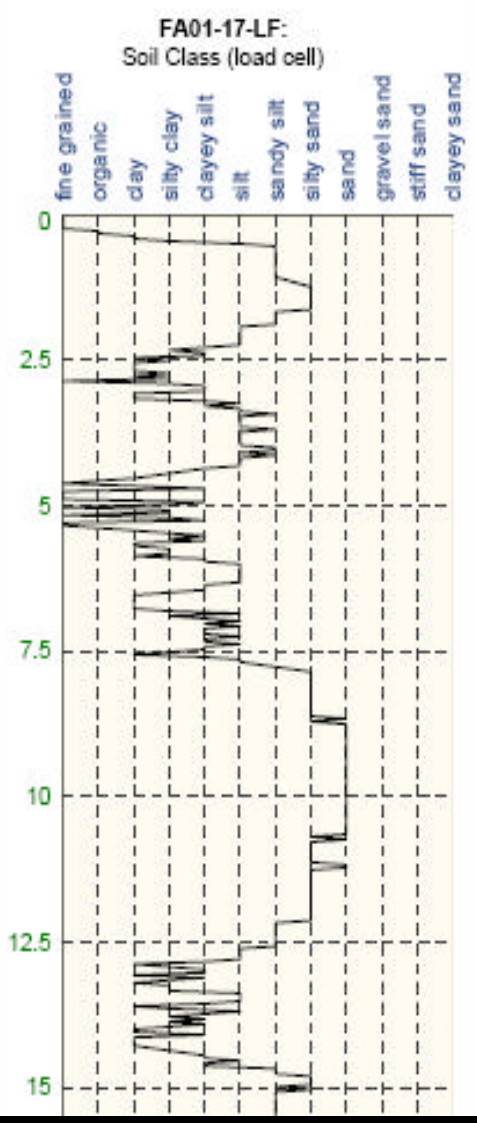
Laboratory Results:
140 mg/kg TPH-Gasoline
40 mg/kg TPH-Diesel

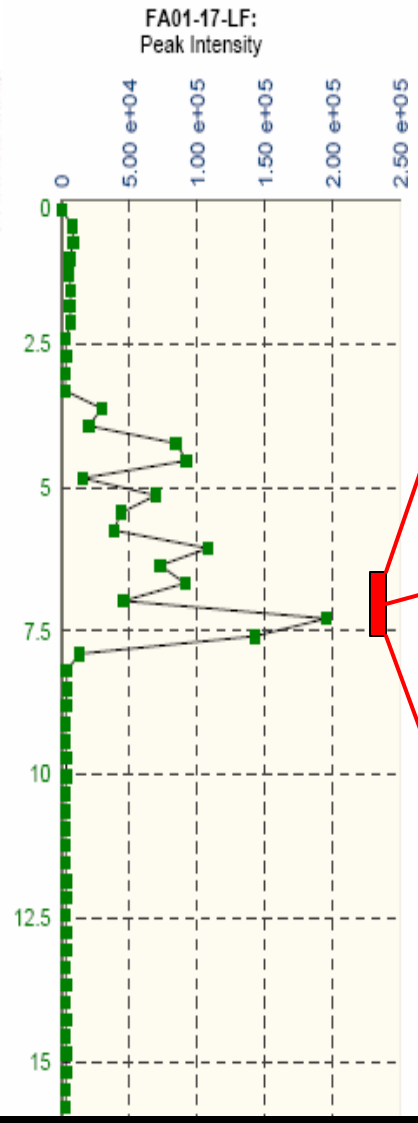
SCAPS LIF results:
50,000 to >250,000 counts

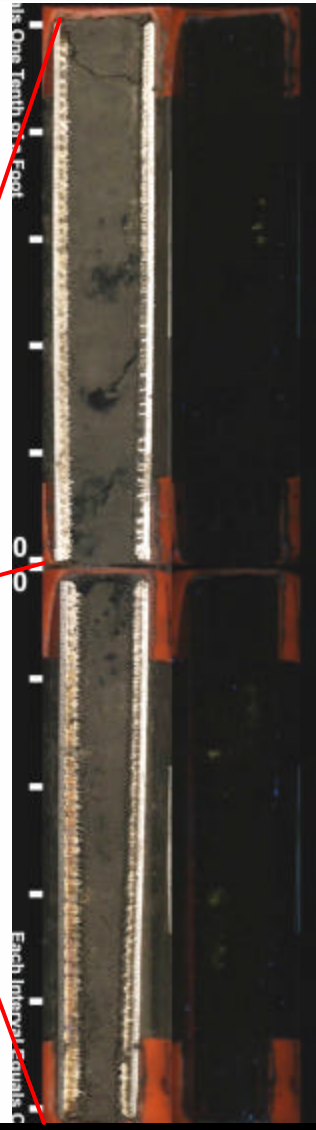
UV Light Photography:
No response

Soil type:
Clay to silt

Temporary Well:
Not installed







Comparison of Site 2 Cores to SCAPS and Laboratory Results

Site 2, SCAPS 10

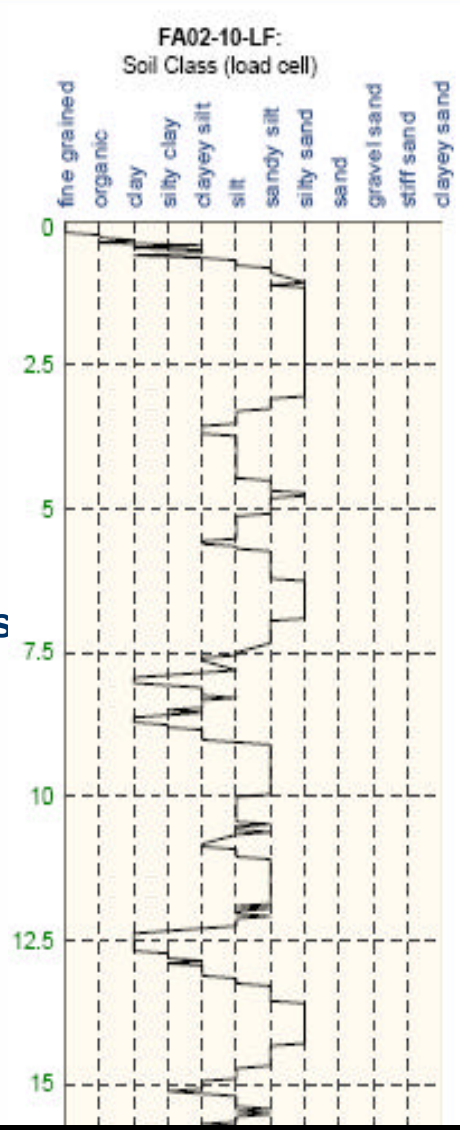
Laboratory Results:
360 mg/kg TPH-Gasoline
ND (<13 mg/kg) TPH-Diesel

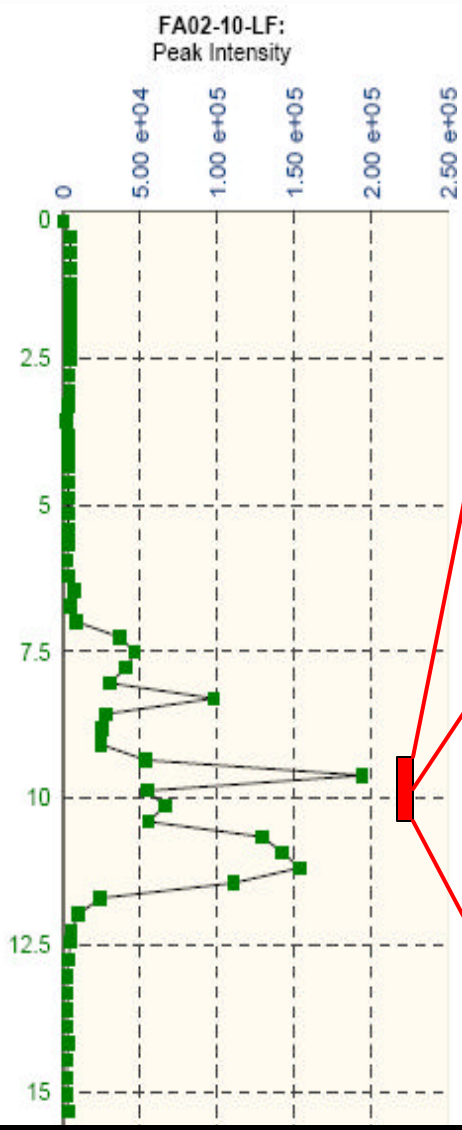
SCAPS LIF results:
50,000 to >250,000 counts

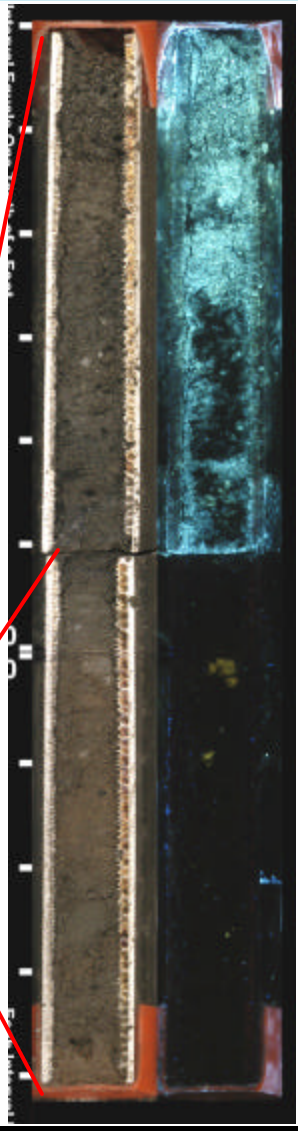
UV Light Photography:
Large response 9.4 to 9.9 ft bgs
No response 9.9 to 10.4 feet

Soil Type:
Sandy silt

Temporary well:
Sheen initially,
3 feet after 2 months







Comparison of Site 2 Cores to SCAPS and Laboratory Results

Site 2, SCAPS 15

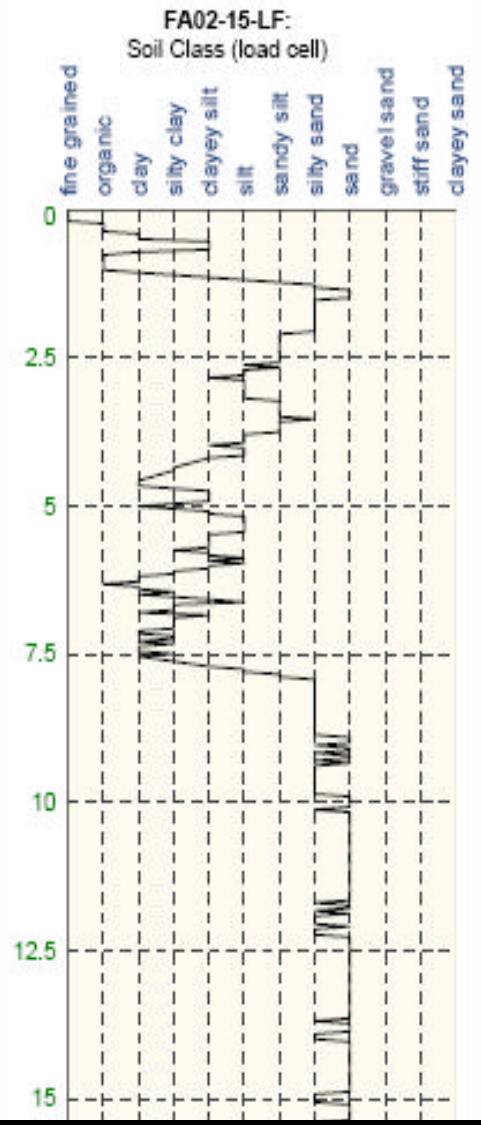
Laboratory Results:
Not analyzed

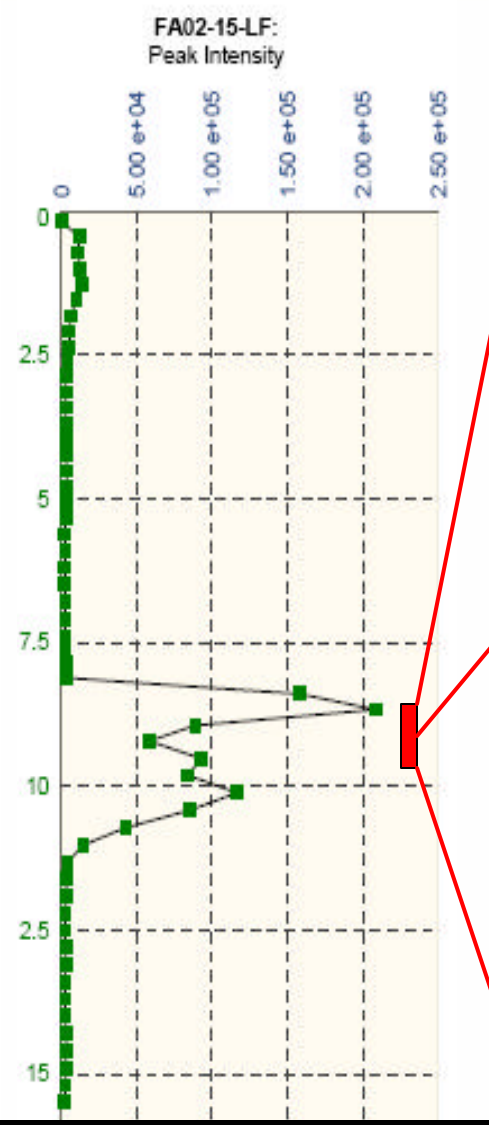
SCAPS LIF results:
60,000 to 200,000 counts

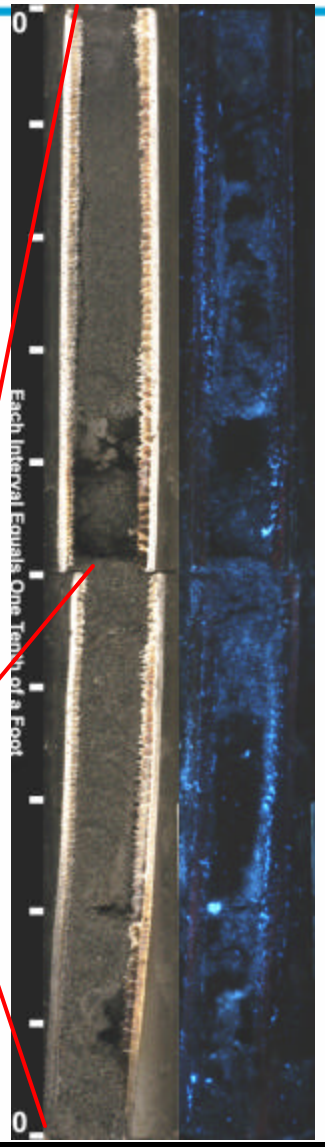
UV Light Photography:
Moderate response

Soil Type:
Sand/silty sand

Temporary Well:
1.93 feet of free product







Comparison of Site 16 Cores to SCAPS and Laboratory Results

Site 16, SCAPS 15

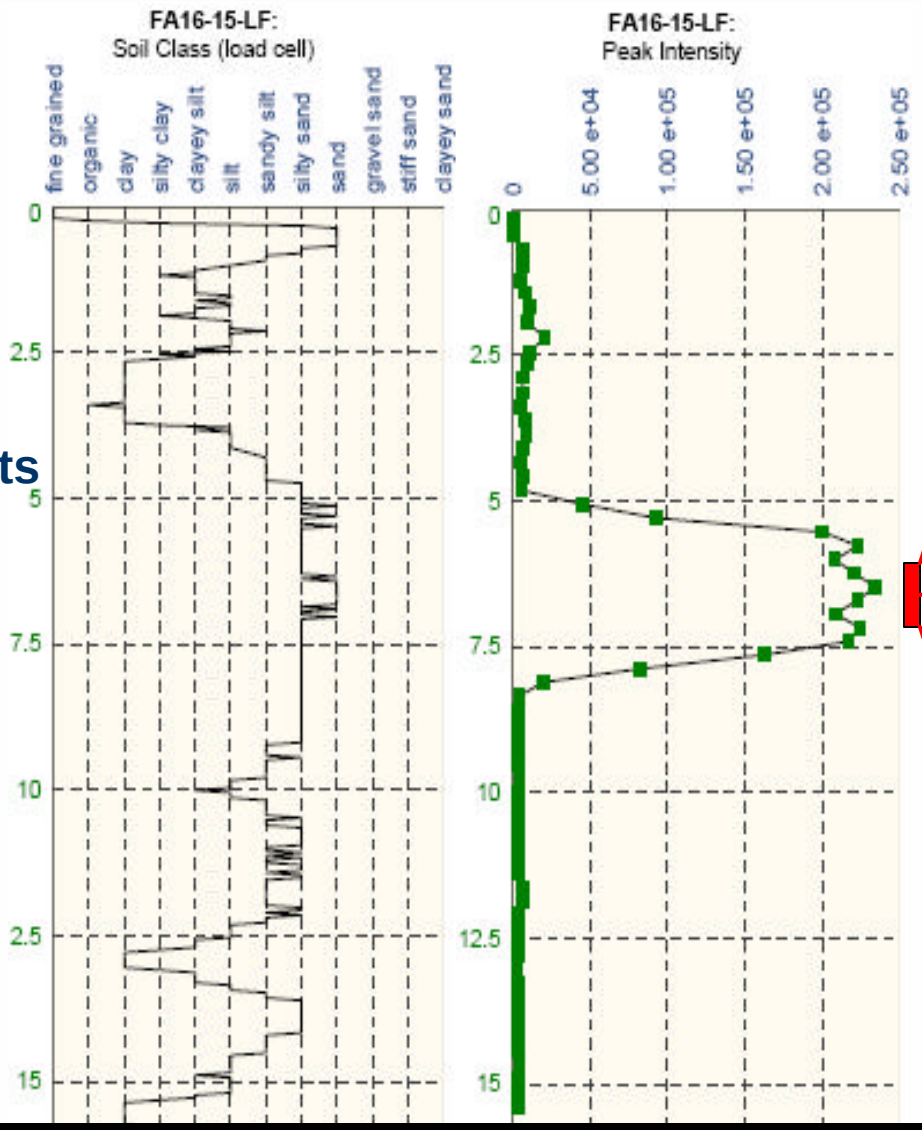
Laboratory Results:
17 mg/kg TPH-Gasoline
6,200 mg/kg TPH-Diesel

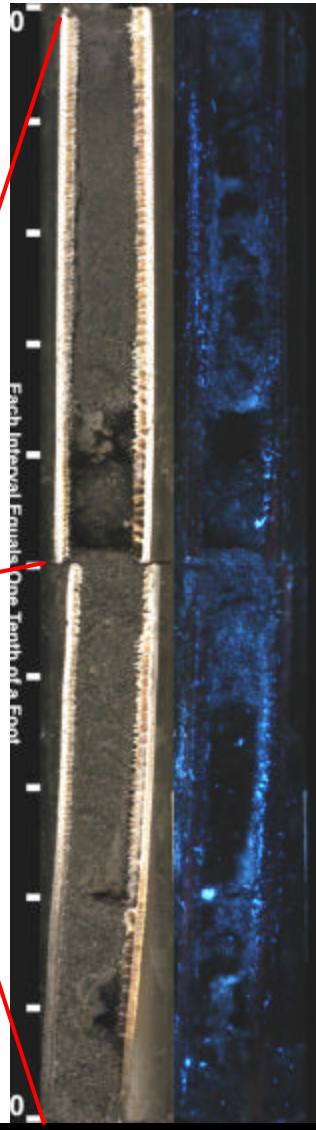
SCAPS LIF results:
200,000 to 240,000 counts

UV Light Photography:
Moderate response

Soil type:
Silty sand / sand

Temporary Well:
0.01-foot





Comparison of Site 16 Cores to SCAPS and Laboratory Results

Site 16, SCAPS 56

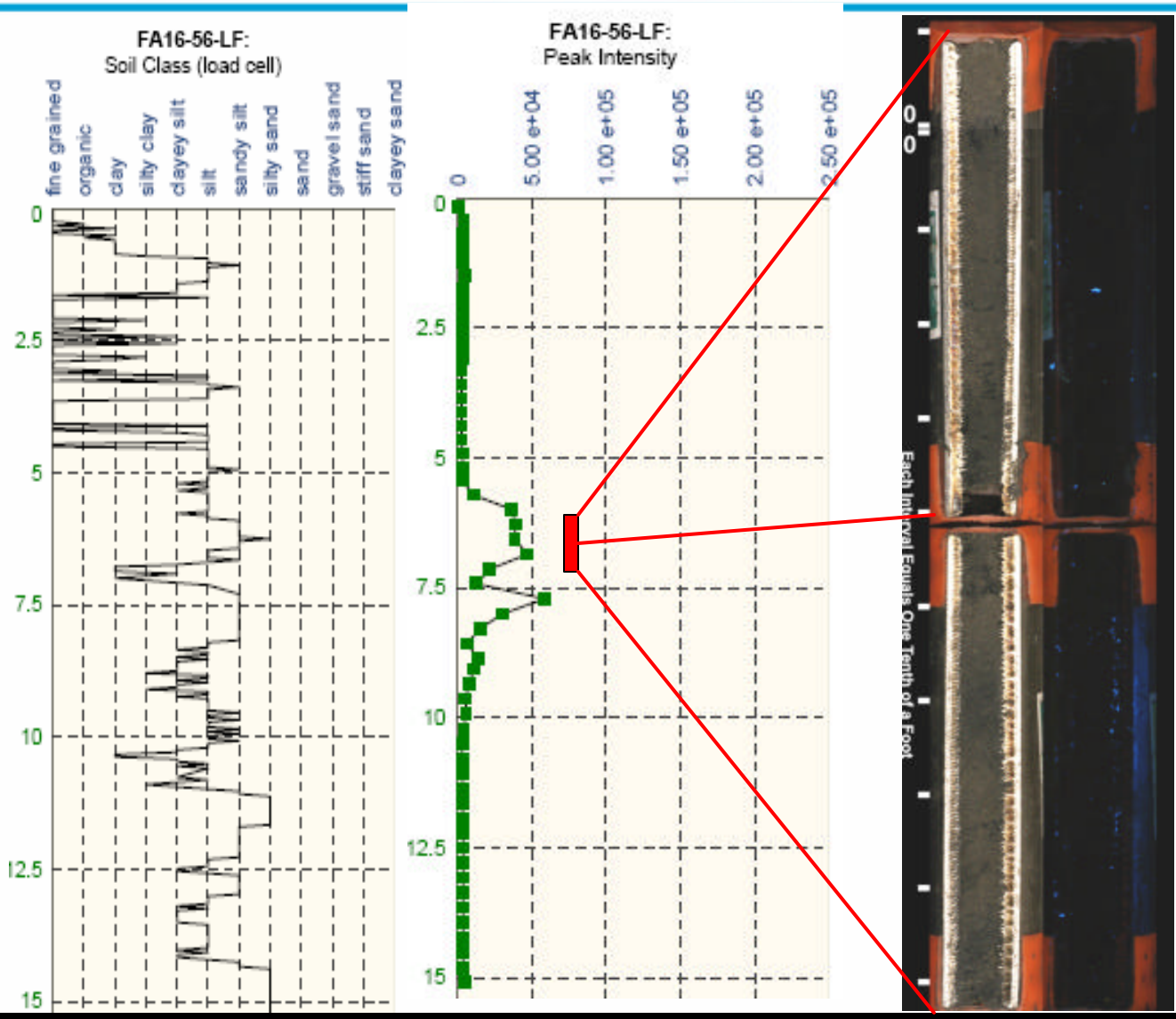
Laboratory Results:
45 mg/kg TPH-Gasoline
1,200 mg/kg TPH-Diesel

SCAPS LIF results:
20,000 to 50,000 counts

UV Light Photography:
Light response

Soil type:
Clay to sandy silt

Temporary Well:
No sheen



Comparison of Site 14 Core to SCAPS and Laboratory Results

Site 14, SCAPS 26

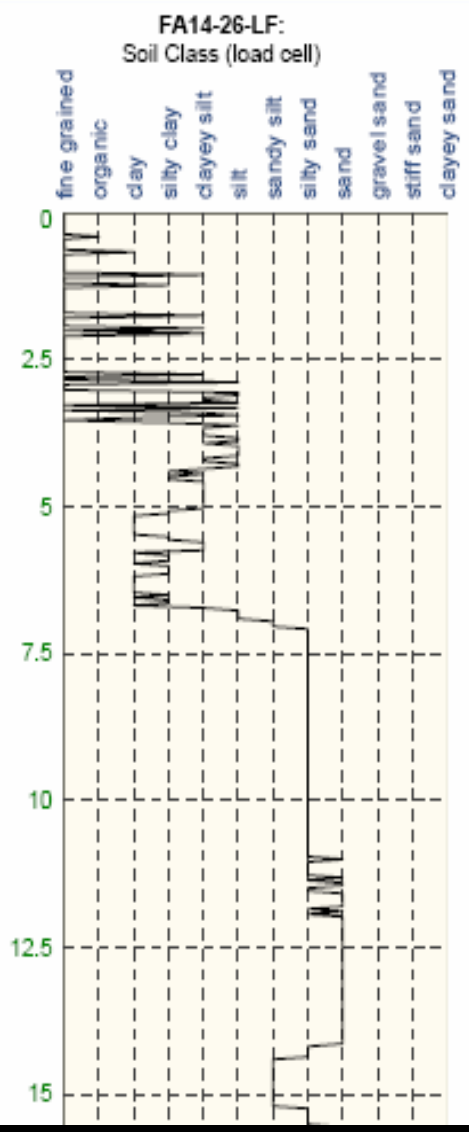
Laboratory Results:
26,000 mg/kg TPH-Gasoline
7,700 mg/kg TPH-Diesel

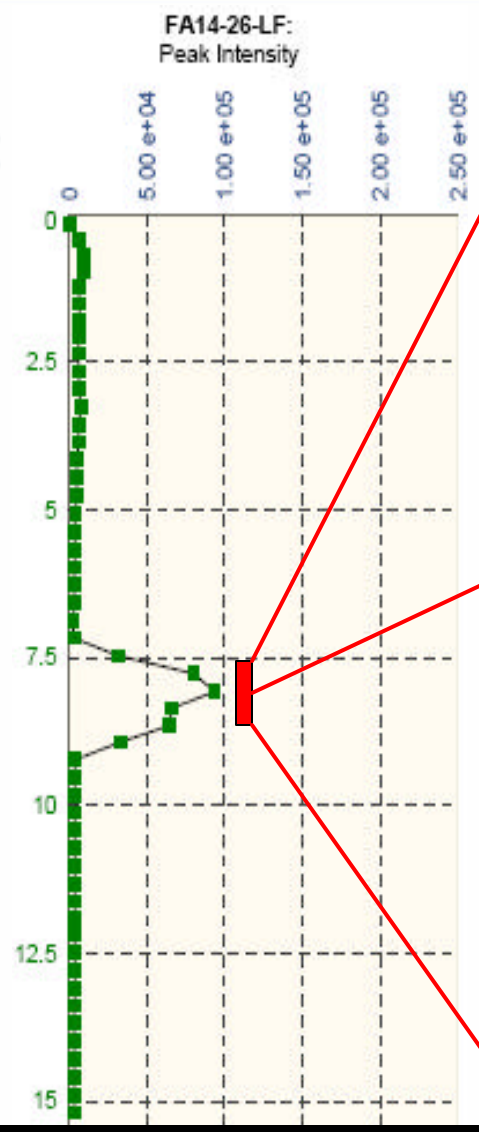
SCAPS LIF results:
60,000 to 100,000 counts

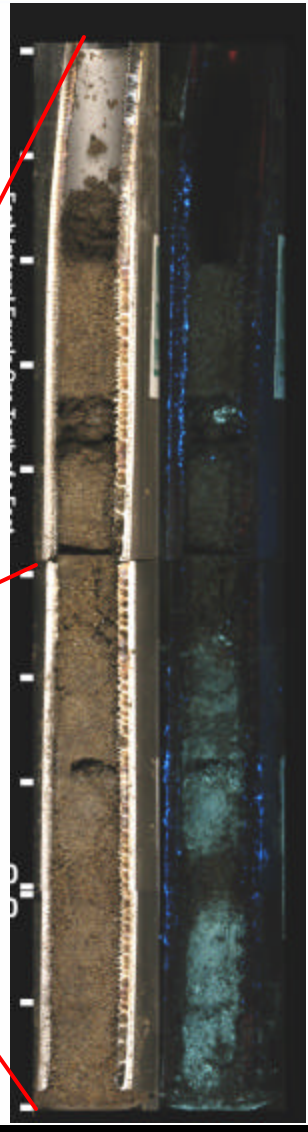
UV Light Photography:
Light response

Soil type:
Silty sand

Temporary Well:
0.21 feet







Comparison of UST 395 Core to SCAPS and Laboratory Results

UST 395, SCAPS 02

Laboratory Results:

37 mg/kg TPH-Gasoline

37,000 mg/kg TPH-Diesel

SCAPS LIF results:

>250,000 counts

UV Light Photography:

Heavy response

Soil type:

Silty sand

Temporary Well:

Not installed